Reviewer Review Report Format

Technical Publication:
Incorporation of Climatic Indicators in SFWMD Planning and Operations

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Reviewer section
Reviewer's name___Gerald R. North_____
Total pages reviewed: ___entire document___ Total review time:___>50 hrs_____

1. *Has the District adequately addressed the long-term wet and dry cycles in modeling for a) facility planning, and b) operational planning. If not, what standard engineering practices can the District modelers follow to address climate variability due to indicators such as AMO.*

I am concerned that the report seems to underplay the impact of global warming. While the report treats the AMO very carefully based upon research in the refereed literature, there may be a reluctance to include the secular trends.

A new paper (Mann and Emanuel: Atlantic Hurricane Trends Linked to Climate Change, EOS, 87, 13 June, 2006) suggests rather convincingly that the AMO does not exist. The inference is that the dip leading into the last cool phase was due to aerosols blowing off the North American continent during the period from the 1940s up to about 1970. In other words, there was only one real dip in the oscillation up to now and the future will be a secular warming trend. Their approach was to use the space-time shapes of the aerosol and GH gas signals in a regression scheme. They fitted these shapes to the data and examined the residuals. These latter seemed to show no significant peak that might be called an AMO. The authors of the current report could not have known about this work, so could hardly be faulted. I will not take a position on whether this EOS paper will stand the test of time. It may not. But the point is that we can expect some pretty serious surprises in the literature over the next decade regarding the connection between GW and Florida rainfall. The SFWMD should keep an open mind with plenty of attention to the idea of adapting planning schemes.

2. *Is there compelling evidence that the volume of inflows to Lake Okeechobee will be as much as double during a wetter cycle as they were in the dry cycle? In the current modeling efforts, has the District adequately addressed the variability of inflows into Lake Okeechobee?*

The volume of inflows is not likely to be double that of the dryer cycle during any one season over the next 25 years, but this answer can only be tentative since it is the subject of ongoing research. The reason for my statement is that the year to year variation in

inflows is so large and the signal to variability ratio is very small (~0.25). The current report did not segregate the contributions from tropical storms from that of normal rainfall. This could be a serious problem if the number and intensity of tropical storms increases significantly over the next few decades. A future study and report should examine this issue to make sure it can be dismissed so easily.

3. *Does the modeling approach used by the District for both CERP and WSE schedule design meet requirements of standard engineering and design practices. If not, what additional steps should the District take to improve modeling for these applied purposes?*

I am not a hydrologist in the engineering sense, but I am familiar enough with the modeling practices to say that the approach taken is a sound one if the climatological inputs are good.

4. *Are the steps being taken in the adaptive management/modeling approach used by the District adequate to address the uncertainties in climate predictions and to assimilate new*
information?

I am very pleased to see this flexibility being built in to the program. It is very important to be able to provide altered facilities as we learn more about global warming and the cycles referred to in the report. It seems to me we do not know enough about either the AMO or GW on the influence they bring to bear on tropical storm frequency/intensity.

5. *Except for basic research approaches, are there other facility planning options that the District should consider to address the possibility of a continued wetter cycle?*

No. The biggest unknown is the basic climatological science. There is reason to expect that there will be huge progress on this part of the problem over the next decade. Climate models are getting better, etc. Hydrology modeling is probably adequate to incorporate these new findings.

6. *Are the data and models used by the District appropriate (reasonable and adequate) for their intended applications?*

Yes, I think the data used in the hydrology models are adequate. The models seem to perform well. There may be concern that there is insufficient data during wetter periods, but the natural interannual variability may be so large as to cover these periods. Nevertheless, the report authors tell us they are using some new data that span a longer period – this is a good undertaking.

Please list any issues/concerns which you feel MUST be addressed before this document can be published.

The lack of separation of tropical storms and hurricanes from the normal rainfall

in Florida. It seems to me that this separation in both the climatological considerations and in the hydrological modeling considerations is essential for correct planning. Doesn't the capacity of the system to contain and channel water depend on how fast it is laid down during an event? Figure 3 in the report clearly shows the importance of separation of these two types rainfall. The slope of this relationship may be a factor of two too small or uncertain because the response depends critically on the type of rainfall (storm or normal) to use it effectively.

There does not seem to be enough attention given to global warming. In the report the anthropogenic influences are dismissed as being the subject of debate. The only debate is in the political sphere – climate scientists have pretty well decided this one. The effects of GW on Florida rainfall are not yet clear, but this is a problem that can and is likely to be solved in the next decade. The next IPCC (Fourth Assessment) is still embargoed, but I think it will show that rainfall rates in Florida will be near neutral over the next 50 years, but warming will be large and therefore evapotranspiration will increase dramatically. This may hold for normal rain, but maybe not tropical storms and hurricanes. The jury is still out on this latter and the SFWMD should monitor the research on climate warming and tropical storm frequency/intensity very closely. A substantial body of literature is building in support of this hypothesis (GW will increase hurricane intensity/frequency). Most of the opposition is in the weather and storm community of researchers, but this is highly dependent on the existence of the AMO as a real natural oscillation. It may not be.

Here are a couple of other concerns:

1. Rainfall and hydrological statistics are highly skewed as indicated in many of the box plots in the report. Some statistical tests do not work so well in such cases.
2. Watch out for tables showing how many entries show high significance levels: after all you would expect 5% of the boxes to be significant at the 95% confidence level even by chance, and watch out for correlation among the members of the table.
3. When you find that the mean is 52" with a standard deviation of 7 or 8, and the signal is 2", you only have a signal to noise ratio of ¼ --- not much to work with. The report wisely considers the envelope of natural variability not associated with AMO to be the basis for planning.

Finally, I think the writers and researchers behind this report have done a good overall job in the assembly of this report. They should be commended for their research and diligence.

Please list areas of the publication that were NOT covered by your review (e.g., References, meeting journal format requirements, adherence to District standards...)

none

Please list any typos or minor format issues that must be corrected.

Page A-iii Exec Summary: line 5: Decibel -> Decadal

Page A-iiii last paragraph: CERP has not yet been defined.
Page 1: 4th line from the bottom “of is program” -> of its program
Page 2: Line 10: “population human” -> ?
Page 5: 2nd paragraph, line 4 from the bottom: “Operate of projects, which that” -> ?
Page 9: 2nd paragraph, line 3 “pesent” -> presented
Page 9: 2nd paragraph, line 7: “have has” -> have
Page 10: figure caption: “very correlation” -> very high correlation
Page 14: last line “trend is occurs” -> trend occurs
Page 15: last paragraph, line 3: “shows” -> show
Page 17: 3rd paragraph, 3rd line from end: “process” -> processes

I have read this technical publication and have provided a careful, objective professional review.
Signature _____
Date_____

Reviewer: Return your completed Review Report to the Project Manager and to the Editor.